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The Bottom Line

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Here are some Internet sites to consult for further information on topics discussed in this issue of *The Bottom Line*:

State Corn Marketing Councils:

Illinois - http://www.ilcorn.org

Iowa - http://www.iowacorn.org

Kentucky - http://www.kycorn.org

Missouri - http://www.mocorn.org/

Ohio - http://www.ohiocorn.org

National Corn Growers' Association
http://www.ncga.com

Purdue Univ. Extension Information on Corn
http://www.agry.purdue.edu/ext/corn/

Indiana Soybean Board
http://www.indianasoybeanboard.com

USDA's Agricultural Biotechnology Web site
http://www.usda.gov/agencies/biotech/

U.S. Regulatory Oversight in Biotechnology
http://www.aphis.usda.gov/biotech/OECD/usregs.htm

U.S. E.P.A. Biotechnology Program
http://www.epa.gov/opptintr/biotech/

Biotech Knowledge Center (by Monsanto)
http://www.biotechknowledge.com/

American Coalition for Ethanol
http://www.ethanol.org

Governors' Ethanol Coalition
http://www.ethanol-gec.org/

Indiana Farm Bureau
http://www.farmbureau.com

Senate Majority Caucus
Indiana Senate Majority Communications
Statehouse 4D-S
Indianapolis, Indiana 46204

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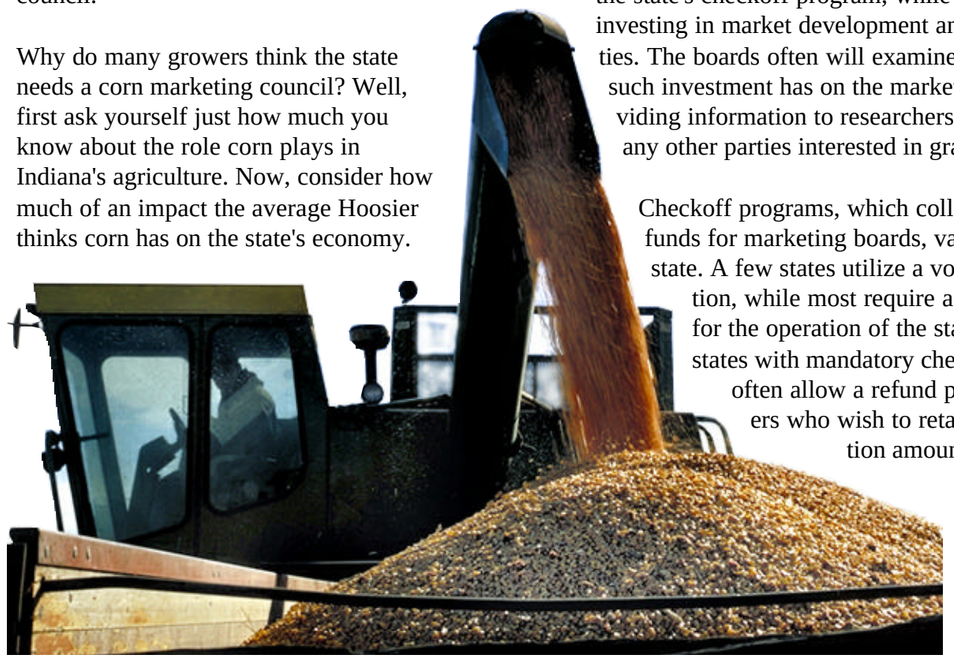
Check-offices

Agriculture plays a vital role in Indiana's economy. Over 15 million acres make up the state's farmland. Less than a third of those acres are used for the production of corn, yet Indiana ranks fifth in the U.S. among corn-producing states. According to the National Agriculture Statistics Service, corn production yields half of the state's cash receipts for agricultural crops, amounting to over $1.4 billion in 1998. And yet, even with the major impact that corn production has on Indiana agriculture, Indiana was until recently one of the only states in the region without a market-supported corn marketing council.

Why do many growers think the state needs a corn marketing council? Well, first ask yourself just how much you know about the role corn plays in Indiana's agriculture. Now, consider how much of an impact the average Hoosier thinks corn has on the state's economy.

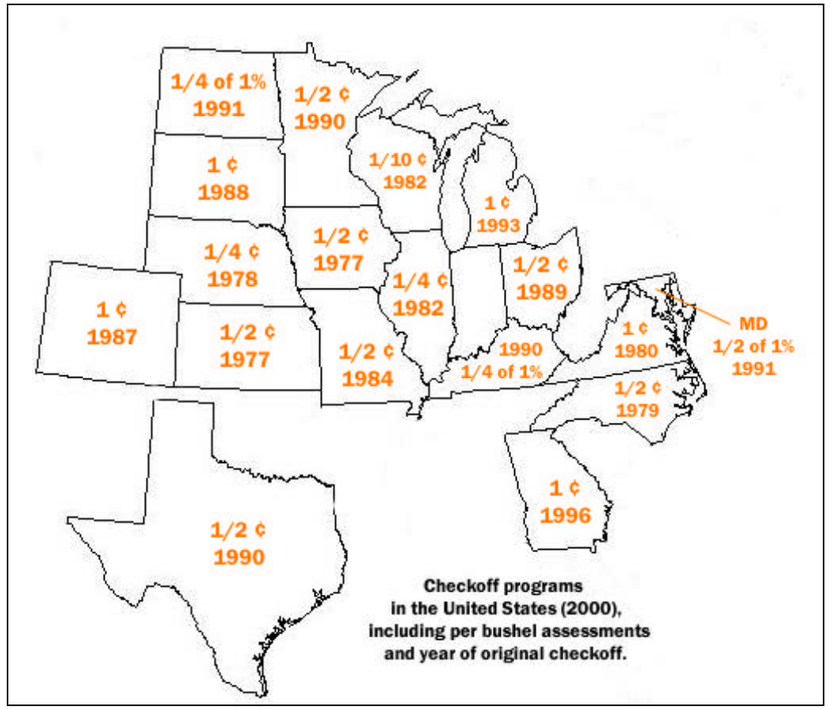


Supporters of the program advocate that such an organization can do nothing but help to promote the importance of corn to Indiana agriculture.

Marketing by definition includes all of the business activities involved in transferring a product from initial production to the hands of consumers. Grain marketing boards are typically designed to maximize the profitability of a state's grain producers. Because many grain markets are very weak, these organizations encourage research and development of new uses. Most legislatively-developed boards administer the state's checkoff program, while identifying and investing in market development and research activities. The boards often will examine the impact that such investment has on the market, as well as providing information to researchers, producers, and any other parties interested in grain production.

Checkoff programs, which collect the operating funds for marketing boards, vary from state to state. A few states utilize a voluntary contribution, while most require a certain deduction for the operation of the state's board. Those states with mandatory check-off amounts often allow a refund procedure for farmers who wish to retain their contribution amount.

Indiana's Soybean Board was initially designed to operate in such a manner. In 1980,



26 states had passed soybean checkoff legislation, leaving Indiana and Ohio as the only two soybean-producing states not to have checkoff programs. However, Congress's 1990 Farm Bill included a provision for a Soybean Promotion and Research Checkoff, which allowed Indiana to facilitate a soybean marketing organization. In 1995, the refund program that had been a part of the soybean checkoff was discontinued in Indiana, as many farmers said that it was not fair that some growers paid the checkoff while others received refunds.

FAST FACT: According to the National Corn Growers' Association, a typical bushel of corn contains 72,800 kernels.

While many marketing boards will admit that the return on investment is often slow to manifest itself, these organizations claim a number of important developments in the industry. Illinois's corn marketing board says they have been quite successful with their support of research, education, public relations and market development programs. According to the Illinois board's Web site, they have invested $4 million in more than 50 scientific projects.

Indiana's soybean board has in the same way invested in a number of research and development projects involving the use of soybeans. Soy-based crayons and soy candles were both significant ventures by the board. The board also sponsors a contest each year with Purdue University to encourage students to develop new ways to utilize soybeans. Besides the crayons and candles, the contest has yielded such products as ski wax and a new soybean cracker.

As many agricultural markets struggle to maintain profitability, the state's economy can suffer from reduced farm activity. Today, many producers admit that the only net gain found in grain production comes from the federal subsidy programs. That means that these government payments - not the sale of the crop itself - are what enables farmers to invest in better equipment and buy non-production goods, thus spurring that sector of the economy. If the grain export market were enhanced, more of that income would enter the state, and thus could be returned to state's economy.

As put by Dr. Joseph Uhl, professor of agricultural economics at Purdue University, "The task of marketing is to convert societies' needs into profitable opportunities." Grain marketing councils are designed to do that by taking the production of the country's food sources, and investing a small portion of the return in products that they see as destined to make that industry more lucrative.

Will Indiana's new corn marketing council increase profits and boost markets? Surely something will at some point, but only time will tell what makes the difference.

Getting Monstrous

For thousands of years, farmers have struggled to produce a crop without suffering great loss to pests. Scientific advancements over recent years have allowed the use of genetic engineering to provide "natural" solutions to a number of these problems.

Genetically-modified organisms, known commonly among producers as "GMOs," have grown prominent on America's farms. Indiana is no exception. So why should Indiana legislators be concerned about GMO production? There are actually several issues that are a part of the debate, but first let us better describe the situation.

What are GMOs?

GMOs are plant breeds which are the result of changes in another plant's genetic structure. While the process sounds complicated, the procedure basically amounts to physically placing a minuscule portion of one plant into another plant, so the latter exhibits desirable characteristics.

The concepts carried out through genetic engineering essentially form a new hybrid of plant, similar to those derived through special breeding. Selective breeding practices have been a regular part of agriculture for decades. Since Gregor Mendel's work with peas in the 19th century, hybrid breeding has become a common practice in order to best produce a successful crop. In corn, for example, producers noticed that if they saved seed from the strongest, most productive plants each year, the following year's crop would yield an overall crop with characteristics similar to that of the parent plants.

The introduction of genetic engineering to agricultural breeding allowed scientists to select specific traits within one plant and place those traits into another plant. This consequently created a plant variety with a complement of desirable characteristics, including productivity improvements, and resistance to disease and other detrimental factors.

Why produce GMOs?

The American Soybean Association estimates that over 50 percent of the country's crop this year will be GMOs. So why do producers want to grow GMOs if the market for them is unstable? Generally the answers hinge on convenience and productivity increases.

Corn and soybeans are the two most widely-used food crops that have undergone forms of genetic engineering. Of the two crops, each has been enhanced to tackle a particular pest problem that farmers encounter during the normal routine of production.

In soybeans, Monsanto developed "RoundUp Ready" varieties which allow growers the ability to apply a glyphosate herbicide, which effectively removes all unwanted green vegetation from a soybean plot. According to several fact sheets about the chemical, the herbicide acts by preventing the plant from producing an essential amino acid, thus reducing the production of protein in the plant, and stopping plant growth. By means of a single application of one herbicide to a flourishing field of soybeans, nearly all of the unwanted vegetation can be removed. The other benefit to using the glyphosate herbicides is the effective non-toxicity of the chemical. Generally, the substance is not harmful to humans, nor does it show dangerous effects on any species of mammals, birds, or even bees. This characteristic alone has been enough to encourage some producers to switch from toxic restricted-use pesticides to the RoundUp technology.

In corn, the RoundUp technology has also been applied. However, the more profitable and economically sound change has been the introduction of "Bt" corn, which is basically a plant variety capable of producing its own insecticide. Corn-borer resistant "Bt" hybrids actually produce the Bacillus thuringiensis (Bt) endotoxin that causes sickness in corn-borers, effectively ceasing insect damage from those pests feeding on the plants. Bt use has also been effective in removing pests from other crops, including beetles in potatoes, and boll weevil in cotton.

So, what is the fuss all about?

There are a number of controversies surrounding GMO production, ranging from seed-purchasing agreements to the health effects of human consumption.

The desire to use many GMO inputs involves extensive legal implications. For example, in order for farmer-producers to legally use the Monsanto RoundUp Ready seeds, the producer is required to enter into a seed-purchasing agreement. The agreement requires the grower to purchase all seed and forbids the grower from saving a crop for use as the following year's seed. This agreement also effectively gives the seed company rights to examine any growing crop or commodity stores that the farmer possesses, in order to determine if the crop is being produced in accordance with those defined conditions. In addition to signing the agreement, producers are required to pay a technology fee, typically $6.50 per 50-pound bag. The technology fee itself is enough to turn some producers away from the technology, as inputs can rise as much $10 per acre or more in nothing other than fees.

Despite growing concerns about the export markets for GMO grain, agricultural producers continue to use the technology. Convenience and faith in emerging markets are just a couple of the reasons farmers cite for continuing to grow GMOs.

The bigger issue is the potential health effects caused by the consumption of food products containing genetically-altered ingredients. While this issue has not been highly evident in America, the effects on the U.S. grain export market have shown their ugly face. Europeans have exhibited an extreme concern about the consumption of GMO grain, thus revolutionizing how U.S. grain purchasers must handle incoming crops. Several months ago, the infamous StarLink corn incident occurred, where the potentially allergenic corn turned up in food products. Originally intended to be used only a livestock feed, StarLink corn was discovered in taco shells and other corn-based foods.

Where are GMO products found?

According to a report from Penn State University, over 60 percent of foods purchased from American supermarkets today contain some ingredients derived from genetically-modified crops.

A number of countries, particularly those in Europe and the Far East, are requiring labeling of food products containing genetically-modified ingredients. Some schools have gone as far as eliminating all GMO-derived foods from their meals.

The demand for certified non-GMO products definitely exists. One Minnesota seed and grain company is currently offering a premium of 50 to 75 cents per bushel to its growers. The particular company markets 31 non-GMO products, many of which are organic, including feed grade grains. While most of the products are corn and soy-based, the company also deals in wheat, barley, rye, and millet, much of which goes to export customers in Europe and the Far East.

Are GMOs currently regulated?

Presently, three federal agencies share the tangled jurisdiction over GMO products. The EPA monitors chemical pesticides used in conjunction with the production of the plants themselves, while the FDA evaluates the processing of the materials into food products. However, the USDA ultimately watches the field conditions and trade policies surrounding GMO grain. Most of the crop varieties are registered with the EPA, and many have been awarded protection by the U.S. Patent Office.

The USDA and FDA have been examining potential labeling requirements, but as of yet, GMO food products are not required to contain any specific distinction from non-GMO foods.

SHELLING OUT THE POWER:

Grain-based alcohol fuels: more glamourous than making moonshine!

With the increasing concern about America's dependence on fossil fuels and foreign oil, a number of solutions have been proposed for addressing the country's energy crisis. While solar and electrical power sources are being examined, alternative fuels may prove to be a viable consideration. Ethanol is one alternative fuel that many of those involved in agriculture support as a solution to relieving the gas crunch.

Did You Know?

One bushel of corn produces 2.5 gallons of ethanol. One acre of corn (about the size of a football field) yields enough corn to produce ethanol which, when blended with gasoline, would operate four cars for one year.

What is ethanol?

Ethanol (also known as ethyl alcohol, grain alcohol, or ETOH) is a clear, colorless alcohol produced in a distillation process similar to that of beverage alcohol. While ethanol is nearly always attributed to corn, it can actually be produced from other vegetables, wood, and grain sources.

Ethanol is used as an automotive fuel by itself and can be mixed with gasoline to form what has been called "gasohol." The most common blend contains 10 percent ethanol mixed with gasoline. There is a movement toward what is know as "E85", which is a blend of 85 percent ethanol mixed with gasoline. Over 1 billion gallons of ethanol are blended with gasoline every year in the United States. Because the ethanol molecule contains oxygen, it allows the engine to more completely combust the fuel, resulting in fewer emissions.

Believe it or not, Ford's original "Model T" was designed to run on ethanol. The fuel was attractive to early engineers because of its high energy and oxygen content. However, America's ethanol industry did not make itself evident until the late 1970s. Dual-fuel vehicles are also nothing new, as many people remember farm tractors that were designed to operate on both kerosene and gasoline.

Is ethanol common anywhere yet?

Most people interact with ethanol on a regular basis. It is not uncommon for most of today's motor fuels to contain about 10 percent ethanol by volume. This serves as an octane booster by providing more oxygen, thus yielding a cleaner, more efficient burn. Ethanol is the preferred oxygenate due to the phase out of methyl tertiary butyl ether or MTBE. While ethanol was originally developed as a gasoline extender and octane enhancer, it eventually became feasible to consider ethanol as a fuel itself.

Economics of ethanol production

According to the American Coalition for Ethanol, more than $3 billion has been invested in 55 ethanol production facilities operating in 20 different states across the country. The organization's figures show that the ethanol industry is responsible for more than 40,000 direct and indirect jobs, creating more than $1.3 billion in increased household income annually, and more than $12.6 billion over the next five years.

The ACE estimates that the ethanol industry directly and indirectly adds more than $6 billion to the American economy each year, and the demand for grain created by ethanol production increases net farm income more than $12 billion annually. Increases in ethanol production offer enormous potential for economic growth in small rural communities. According to USDA estimates, a 100-million gallon ethanol plant could create 2,250 local jobs.

Domestic ethanol and ETBE production reduces demand for imported oil and imported MTBE, which now represents almost 80 percent of the U.S. trade deficit. Recent figures by the ACE estimate that imported oil accounts for about 53 percent of oil used, and imported MTBE is at a record 31 percent of domestic production. Today, ethanol reduces the demand for gasoline and MTBE imports by 98,000 barrels per day. A 98,000 barrel/day replacement of imported MTBE would represent a $1.1 billion reduction to our annual trade deficit.

The ACE states that ethanol production is extremely energy efficient, with a positive energy balance of 125 percent, compared to 85 percent for gasoline. Ethanol production is a very efficient method of producing liquid transportation fuels. According to USDA, each BTU used to produce a BTU of gasoline could be used to produce 8 BTUs of ethanol.

Effects on American agriculture

Industrial corn use, which includes ethanol and sweetener production, is now the second largest consumer of corn in America. According to the ACE, each $1 of up-stream and on-farm economic activity generates $3.20 in downstream economic stimulus attributable to ethanol processing, compared to just $0.31 when corn is exported.

The demand for corn created by the ethanol industry increases crop values -- accounting for approximately $0.14 of the value of every bushel of corn sold. The ACE estimates that if the market for ethanol did not exist, corn stocks would rise and net income to American corn farmers would be reduced by $6 billion over the next five years, or about 11 percent. Many farmers now own and operate ethanol plants, allowing them to add value to their own corn.

How does the government fit into this?

Many believe that the government should encourage and support programs that promote the use of American agriculture to relieve the energy crisis. The National Corn Growers Association estimates that U.S. farmers produce nearly ten billion bushels of corn annually. Some reports suggest that in the near future as much as two billion bushels of corn could be grown solely for purposes of ethanol production.

HOW IS ETHANOL PRODUCED?

1. Milling: The grain is first passed through hammer mills, which grind it into a fine powder called meal.

2. Liquefaction: The meal is then mixed with water and alpha-amylase, and cooked until the starch is liquefied. Heat is applied at this stage to enable liquefaction. Cookers with a high temperature stage (120-150 degrees Celsius) and a lower temperature holding period (95 degrees Celsius) will be used. These high temperatures reduce bacteria levels in the mash.

3. Saccharification: The mash from the cookers is then cooled and the secondary enzyme (gluco-amylase) will be added to convert the liquefied starch to fermentable sugars (dextrose), a process called saccharification.

4. Fermentation: Yeast is added to the mash to ferment the sugars to ethanol and carbon dioxide. Using a continuous process, the fermenting mash will be allowed to flow through several fermenters until the mash is fully fermented and then leaves the final tank. In a batch fermentation process, the mash stays in one fermenter for about 48 hours before the distillation process is started.

5. Distillation: The fermented mash, now called "beer," will contain about 10 percent alcohol, as well as all the non-fermentable solids from the corn and the yeast cells. The mash is pumped to the continuous flow, multi-column distillation system where the alcohol is removed from the solids and the water. The alcohol will leave the top of the final column at about 96 percent strength, and the residue mash, called stillage, is transferred from the base of the column to the co-product processing area.

6. Dehydration: The alcohol from the top of the column is passed through a dehydration system where the remaining water is removed. Most ethanol plants use a molecular sieve to capture the last bit of water in the ethanol. The alcohol product at this stage is called anhydrous (pure, without water) ethanol and is approximately 200 proof.

7. Denaturing: Ethanol that will be used for fuel is then denatured with a small amount (2-5 percent) of some product, like gasoline, to make it unfit for human consumption.

Process description adapted from information produced by the American Coalition for Ethanol.